

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Devices for Sorting a Line of Articles into Measured Groups

We, SCHWEIZERISCHE INDUSTRIE-GESELLSCHAFT, a Swiss Company, of 8212 Neuhausen am Rheinfall, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to a device for sorting into measured groups or columns a line of articles, such as biscuits.

Sorting devices are already known in which a line of articles is always transported through a certain distance and a separating slide is introduced between the articles to separate a certain length of the line. It is also known to use a toothed counting wheel driven by the line of articles wherein the wheel teeth engage between the rounded off or chamfered narrow sides of the articles and count off a number of articles moving past the wheel. After the passage of a certain number of articles the wheel actuates a switch member which controls a separating mechanism such as a separating slide.

These known devices have only met with partial success in practice. In the first device, there is the danger, that the objects might be damaged by the separating slide, for example, in the case of fragile biscuits or similar articles, whilst with the counting wheel there is the risk that an article, such as a biscuit, with less sharp edges than adjacent biscuits, is not counted by the wheel.

According to the present invention a device for sorting a stack of flat similar articles, for example biscuits, into measured groups or columns, comprises a conveyor so arranged that the stack travels lengthwise on its side along the conveyor with the individual articles substantially vertical but supported by the subsequent articles by leaning back on the subsequent articles to a slight degree, a count-

ing or measuring device for articles passing through said device and a means other than the conveyor for advancing each successive leading article from the stack on to an incomplete group or column and means for deactivating the conveyor and said other means when a predetermined number or other measurement has been recorded by said counting or measuring device.

The advancing means may conveniently be arranged to lift and displace each successive article and is preferably a current of a gas, preferably compressed air issuing from at least one nozzle.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of a device according to the invention in the operating position after an effected count;

Fig. 2 is a side elevation of a part of the device of Fig. 1 in the operating position, after the start of the count;

Fig. 3 shows, diagrammatically, a drive for advancing a conveyor belt;

Fig. 4 shows, diagrammatically, a control for a compressed gas nozzle and for the conveyor belt drive;

Fig. 5 is a side elevation of a belt guide carriage with a guide and clamp device for advancing the separated group of articles;

Fig. 6 is a cross-section along the line VI—VI in Fig. 5;

Fig. 7 is a view similar to Fig. 5 after the articles have been lifted off the band guide carriage;

Fig. 8 is a cross-section along the line VIII—VIII in Fig. 7;

Figs. 9 and 10 are a side elevation and a plan, respectively, of the belt guide carriage;

Fig. 11 shows a second embodiment of the invention; and

Figs. 12 and 13 are a side elevation and

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plan, respectively, of a third embodiment of the invention.

Articles such as biscuits 6 are fed in a substantially upright condition and in line on to a double endless conveyor passing over rollers 2,3,4 and 5. The direction of feed is indicated by arrow A and the biscuits are retained in position laterally by a guide, not shown in the drawings. The conveyor 1 transports the biscuits as a continuous stack, line or column 6 in the direction A. A lever 9, pivotable about a pivot 10 so as to effect a reciprocating movement is driven from a main shaft 7 via an eccentric 8. (See Fig. 1.) The outer end of the lever is connected to a pull rod 12. A belt 11 passes over a roller 13, coaxial with the rollers 2 (Fig. 3) and is tensioned by a spring 14. On spindle 15 of the rollers 2, there is arranged a free-wheel coupling, as known in the art, which connects the rollers 2 to the roller 13 during a delivery stroke of the lever 9 to rotate the roller 2 in the direction B, whilst during a reverse stroke of the lever 9 the roller 13 does not drive the rollers 2.

The rod 12 is coupled to a displaceably mounted belt guide carriage 16, on which the rollers 3 and 4 are mounted. The carriage effects a reciprocating to-and-fro movement, whilst the conveyor belt 1 guided thereby advances always only in the direction of delivery A. The carriage 16 is shown in its outermost end position in Fig. 1. Fig. 2 shows the carriage during a working stroke, shortly after it has left its innermost end position.

The carriage 16 is equipped with a stop 17 for the counted biscuits 6, and pivotable between a position shown in Fig. 1 and a position shown in Fig. 7. The stop 17 is articulately connected to an axially displaceable rod 18, the function of which will be explained below.

A guide rail 19 is located above the incoming biscuits 6 on the conveyor 1. The guide rail 19 serves to incline the biscuits slightly to the perpendicular as shown in Figs. 1 and 2. In this way, with biscuits, or other objects having sharp not rounded edges, the upper surface of the column forms a series of steps, into which a counting wheel 20 can engage. This wheel 20 is mounted rotatably on a lever 22 which is pivotable about a stationary spindle 21. The wheel has a saw-tooth periphery which engages, on the one hand, the stepped upper surface of the column of biscuits and, on the other hand, engages a pivot arm of a pair of electric contacts 24, causing an electric impulse to be transmitted for every biscuit passing beneath the wheel 20.

The counting wheel 20 is driven by the biscuits themselves passing thereunder. It is also connected to the rollers 2 by elastic belts 25, 26 which permit a certain amount of slip. In this way, one or more biscuits of the line which are not of the same height as the majority, are nevertheless counted.

Compressed air nozzles 27 are arranged downstream of the counting wheel 20. These direct an air blast on to the biscuits to advance them individually from the advancing column, as shown in Fig. 2 towards the stop 17 so that the required number of biscuits gradually builds up in front of the stop to form a column 6a. For the sake of clarity, the nozzles 27 are shown in Figs. 1 and 2 at a distance from the counting wheel 20. In practice, however, they will be arranged preferably adjacent thereto so that a biscuit issuing from beneath the counting wheel is propelled immediately by the air blast.

A slide 28 (Figs. 1 and 2) is movable in the gap between the columns 6 and 6a. The slide 28 is moved vertically up and down by means of a two-armed lever 50 acting through an eccentric 51. A further eccentric 29 acts through a two-armed lever 52 and a push rod 53 on the slide 28 and rotates the same relative to the lever 50. The eccentrics 29 and 51 are mounted on a shaft 54 which is connected by a chain 30 to the main shaft 7. The levers 50 and 52 are freely rotatable on a shaft 55. The slide 28 pushes the column 6a of counted biscuits against the stop 17 in a vertical condition and supports the column 6a until it is taken over by a device, described hereinafter.

Figs. 5 to 8 show a device for removing columns 6a of counted biscuits from the carriage 16. A carrier 30a carries two bars 31 which extend along both sides of the column 6a of biscuits on the carriage 16 and to which are fitted strips 32 of soft rubber or the like. The two bars are pivotable through 90° from the position shown in Figs. 5 and 6 into the position shown in Figs. 7 and 8. In the former the strips 32 face downwardly. In the latter, the two strips 32 face each other, and clamp the column of biscuits 6a so that it can be lifted off the carriage 16 and transported to a next processing station.

Figs. 9 and 10 show one arrangement for operating the stop 17. In Fig. 10, which shows the carriage in plan view, the double conveyor 1 has been omitted. A toggle lever 33 is pivotably mounted on a side member of the carriage 16 and has, on one end, a roller 34 which rests against a wall 35. This wall or abutment 35 is adjustable in the direction of the twin arrow C. The other arm of the lever 33 has a longitudinal slot 36 into which engages a pin 37, which is mounted rigidly on a rod 18. A biased tension spring 38 tends to pull the head 18a of the rod on which the stop 17 is pivotably mounted, to the right, as shown in Fig. 10. In this way, the stop, equipped with suitably curved surfaces 17a on its three prongs, is pivoted into a recessed position, shown by dotted lines in Fig. 7, and the roller 34 moves the wall outwardly. When the wall 35 is moved towards the carriage 16, the toggle lever 33 moves the rod 18 towards the left. In this manner, the stop 17 whose surfaces

17a are in permanent contact with the spindle 3a (Fig. 9), is gradually moved into the erect position of Fig. 1. The movement of the wall 35 is controlled, for example, by eccentrics not shown, from the main drive of the machine.

Fig. 11 shows diagrammatically another embodiment of the invention. The spindle 21 carries a pivotable arm 39, the lower end of which is equipped with a slide block 40. The arm 39 is urged against the column of biscuits by its own weight or by the force of a spring, not shown. The block 40 has a slot 41 through which passes an arm of a toggle lever 42 whose other arm 43 carries the movable contact of a pair of electrical contacts 44. The toggle lever 42 is pivotal at 45. A spring 46 tends to close the contacts 44. However, each biscuit 6 passing beneath the slide block 40 pivots the lever 42 against the pressure of the spring 46 thus separating the contacts 44 to interrupt the current to the counter.

The operation of all the devices is shown diagrammatically in Fig. 4, which relates to the embodiment of the counting wheel as shown in Fig. 1. Each biscuit passing underneath the counting wheel 20 advances the wheel by one division, causing thereby a closure of the contacts 24 and an impulse in the control device 47, the construction of which does not form a part of the invention. The control device 47 records the current impulses and, after a predetermined and adjustable number of impulses have been recorded, a magnetic valve 48, shuts off the supply of compressed air to the nozzles 27. Simultaneously, a magnetic clutch 49 is actuated, which restrains the lever 9. This halts the belt 1 and thereby the advance of the column of biscuits. During the further rotation of the shaft 7, the slide 28 is actuated as hereinbefore described. The counted column 6a of biscuits is then gripped by the bars 31 and moved to a further processing station. At this stage, the wall 35 shown in Fig. 10 is moved outwards away from the carriage 16, enabling the lever 33 to effect a clockwise pivotal movement as the action of the spring 38 displaces the rod 18 to the right, retracting the stop 17. Then the circuit of the magnetic clutch 49 is interrupted, as known in the art. The lever 9 is actuated again by the eccentric 8, causing the carriage 16 to be moved to its inner end position and the belt 11 to its start position. The device is now ready to count a next column of biscuits. Immediately before the start of each working stroke of the lever 9, the wall 35 is moved inwards towards the carriage 16 to restore the rod 18 to the left and raise the stop 17 to its upright position and the magnetic valve 48 is opened, as known *per se* so that the nozzles 27 are fully effective at the moment, when the column begins again to move.

If the biscuits are not to be counted, but are to be divided in columns into groups of a predetermined height, the counting wheel is replaced by a member movable as a function of the advance of the line, for example, the belt 1, the rollers 2, the lever 9, or the like. When the line of biscuits has been advanced by an amount corresponding to the desired length of the column, this member affects a control device which, in a manner similar to the Fig. 4 embodiment, stops the supply of compressed air to the nozzles 27 through the magnetic valve 48 and restrains the lever 9 by means of the magnetic coupling 49 and thereby stops the belt 1.

The counting wheel can be replaced by a light barrier 50, 51 as known in the art (see Figs. 12 and 13). In this case, during the advance of the line, the biscuits reach the zone of the nozzles 27, the jet of which separates each individual biscuit from the line and displaces it towards the stop 17 carried along by the carriage 16. During this transfer, each biscuit breaks, for a moment, the light beam of the light barrier 50, 51 and is counted. When the required number has been reached, the supply of air to the nozzles 27 and the advance of the line are interrupted as in the device equipped with a counting wheel.

WHAT WE CLAIM IS:—

1. A device for sorting a stack of flat similar articles, for example biscuits, into measured groups or columns, comprising a conveyor so arranged that the stack travels lengthwise on its side along the conveyor with each individual article supported by the following articles by leaning back on said following articles, a counting or measuring device for articles passing through said device, article advancing means other than the conveyor for advancing each successive leading article from the stack onto an incomplete group or column, and means for deactivating the conveyor and said article advancing means when a predetermined number or other measurement has been recorded by said counting or measuring device.
2. A device as claimed in claim 1 in which the counting or measuring device includes a counting wheel having peripheral teeth engaging the edges of the articles.
3. A device as claimed in claim 2, in which the counting wheel is connected by endless, flexible and elastic transmission members to drive rollers of the conveyor.
4. A device as claimed in claim 1 in which the counting or measuring device includes a pivot arm for resting on the surface of the incoming stack of articles, and carrying a lever, actuated by the articles passing thereunder, which lever operates electrical contacts.
5. A device as claimed in claim 1 in which the counting or measuring device includes a photoelectric cell.
6. A device as claimed in claim 1 in which the counting or measuring device includes a

member which is displaceable during the movement of the stack as a function of its travel.

7. A device as claimed in any preceding claim in which a control device actuated by the counting or measuring device is arranged to de-activate temporarily both the article advancing means and the conveyor.

8. A device as claimed in any one of claims 1 to 6 in which the conveyor is an intermittently movable conveyor belt, the conveyor belt being supported by a longitudinally movable belt guide carriage having a limit stop for the measured group or column of articles adapted to be pivotable between an upright position perpendicular to the guide carriage and a position fully recessed within the guide carriage.

9. A device as claimed in claim 8 in which a control device actuated by the counting or measuring device controls a disengageable clutch on a drive lever of the conveyor and of the carriage to deactivate the conveyor.

10. A device as claimed in any preceding claim in which the article advancing means for advancing each successive leading article

is at least one gas nozzle for directing one or more flows of gas to effect such advance.

11. A device as claimed in claims 7 and 10 in which the control device controls a blocking valve in the gas supply to the nozzle or nozzles.

12. A device as claimed in claim 8 in which stacked, counted articles on the belt guide carriage are laterally guided by rods having mounted thereon strips of flexible material, and in which the rods are pivotable through 90° in order to clamp the articles between the strips and to enable them to be lifted off the carriage.

13. A device for sorting into measured groups or columns, a line of objects, such as biscuits, constructed, arranged and adapted to operate substantially as hereinbefore particularly described with reference to and as illustrated in Figures 1 to 10 or in Figures 1 to 10 as modified by Figure 11, or Figures 12 and 13 of the accompanying drawings.

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Fig. 1

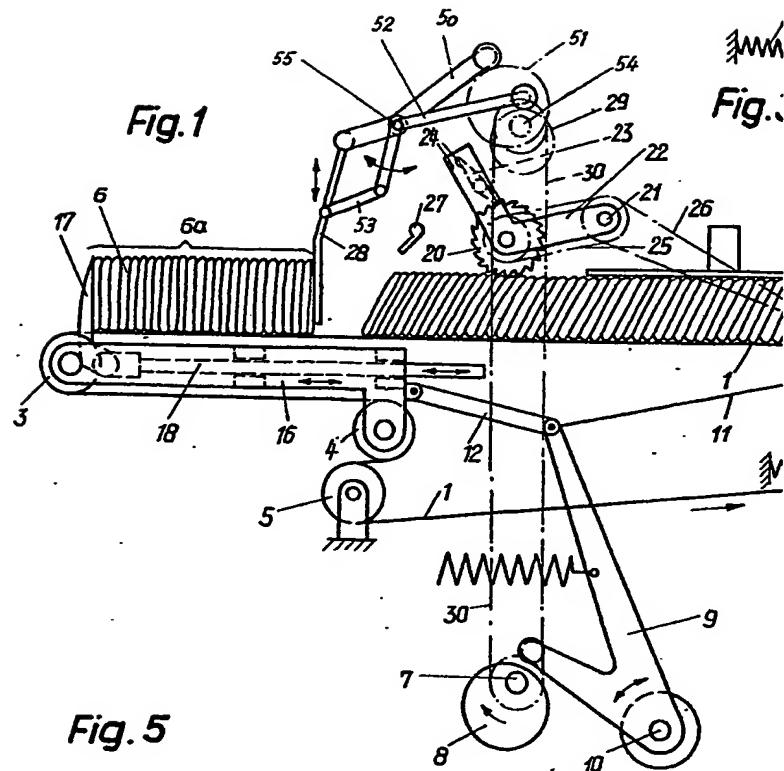
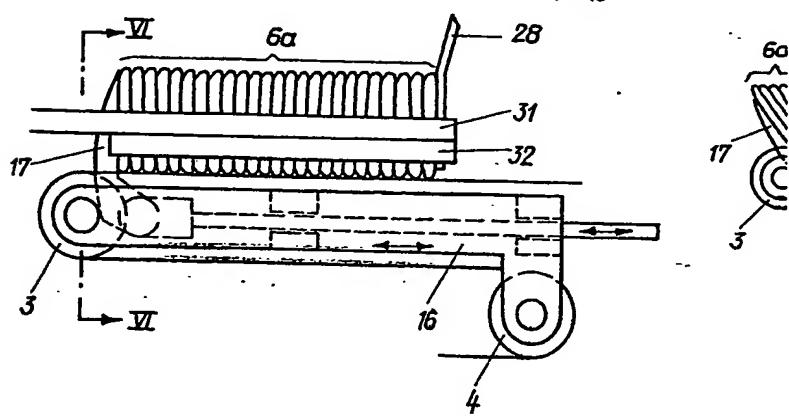


Fig. 2



Fig. 5



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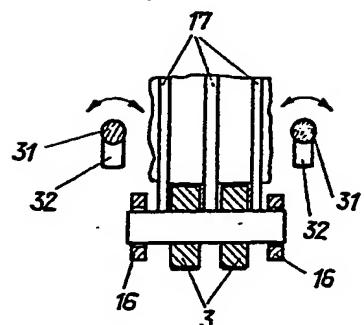
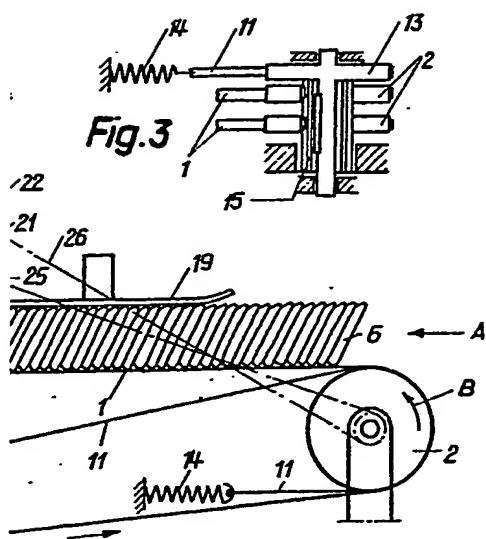
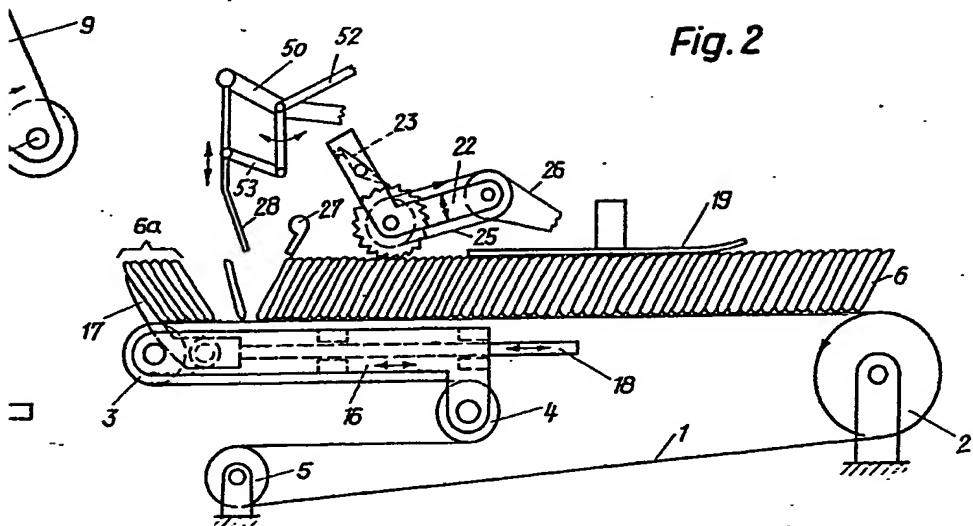


Fig. 6



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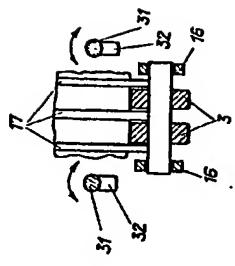
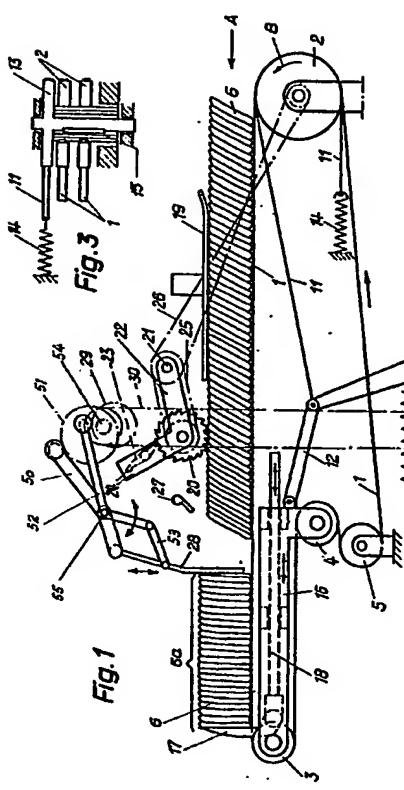
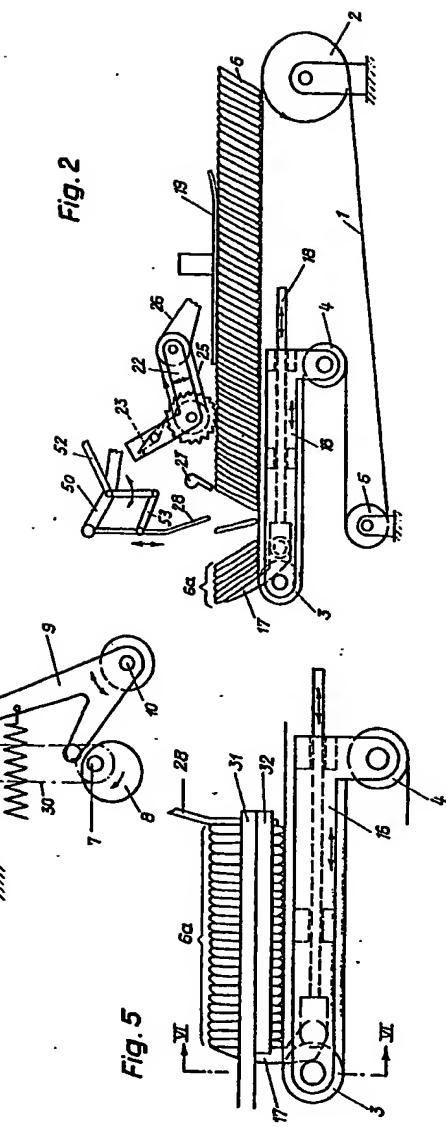
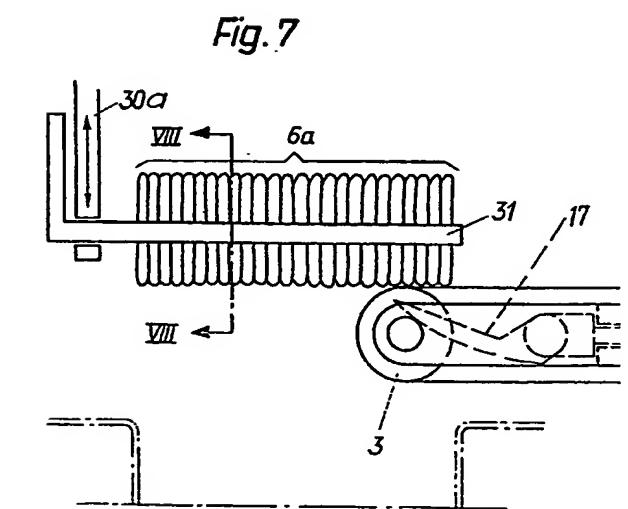
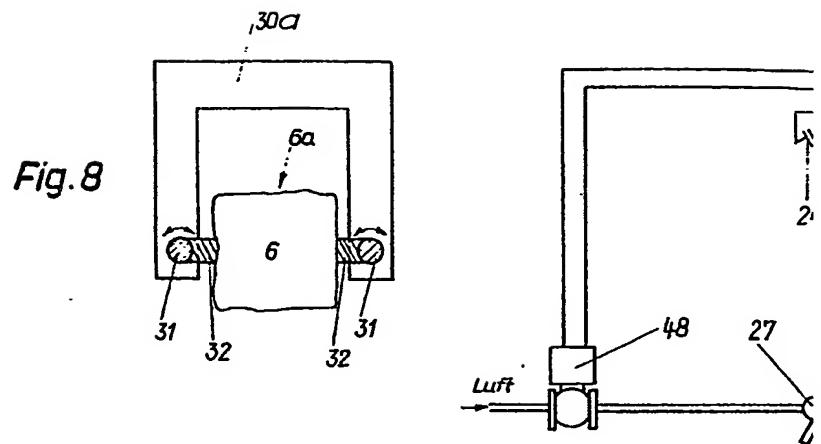


Fig. 6





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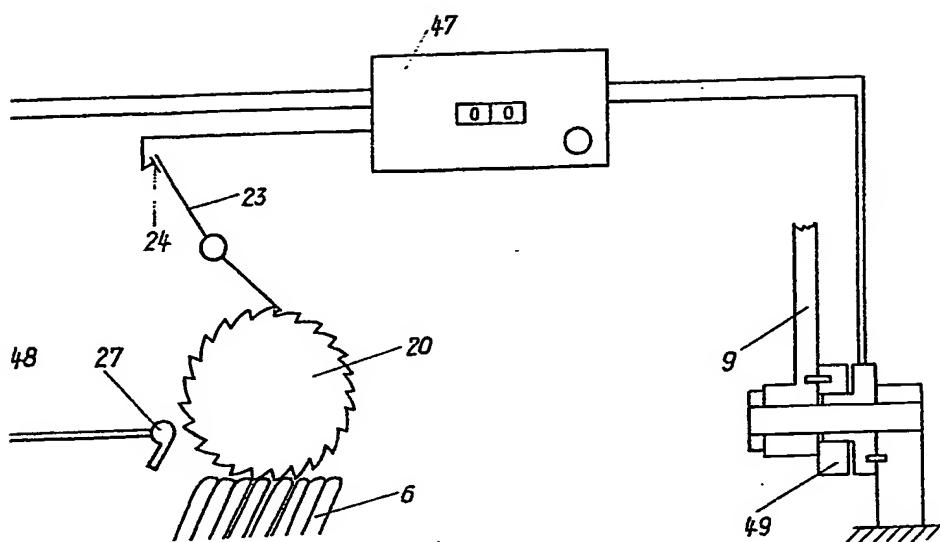
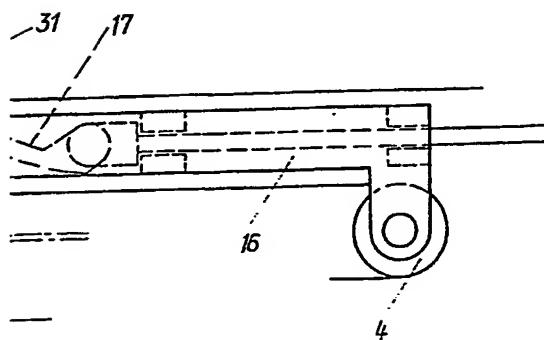


Fig.4



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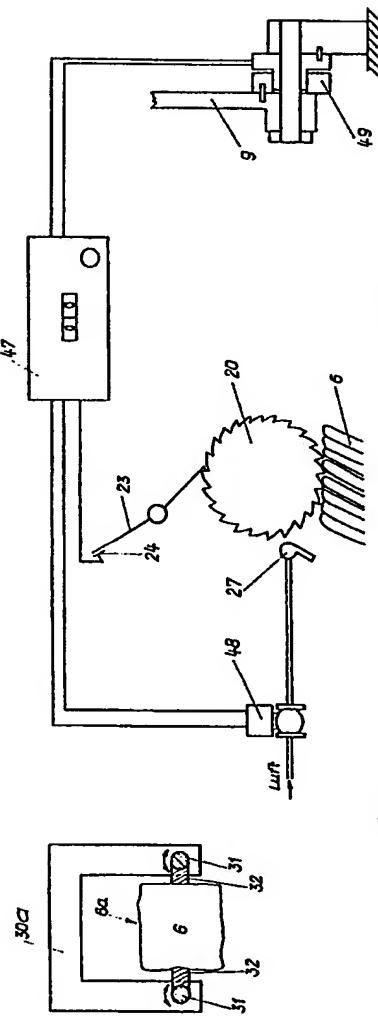


Fig. 7

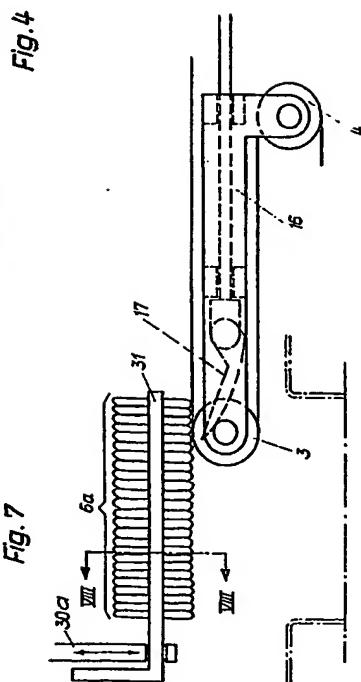


Fig. 4

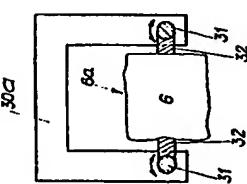
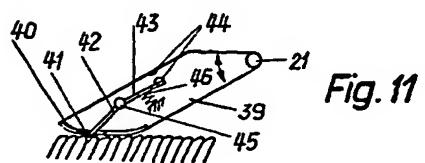
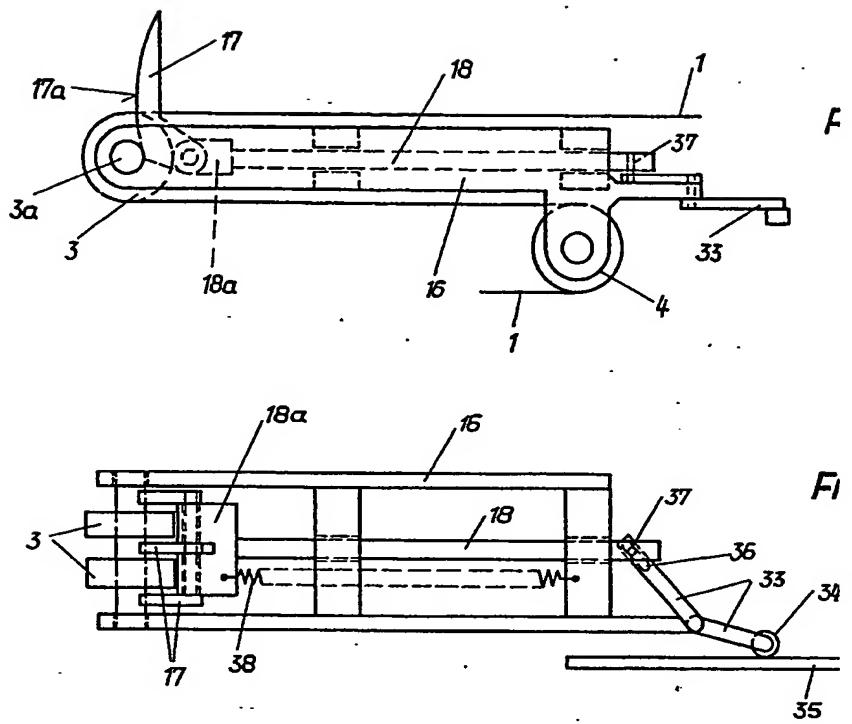


Fig. 8



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Fig. 9

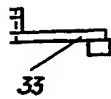


Fig. 10

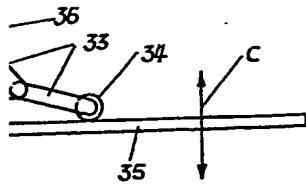


Fig. 12

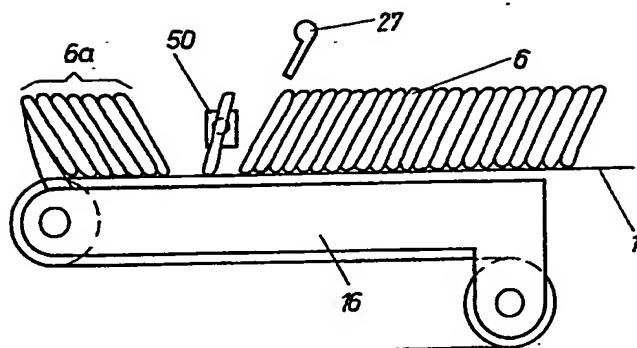
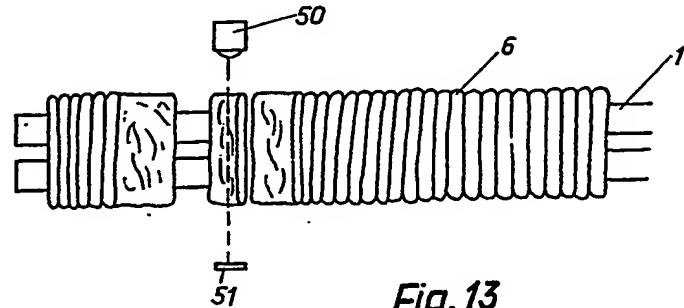


Fig. 13



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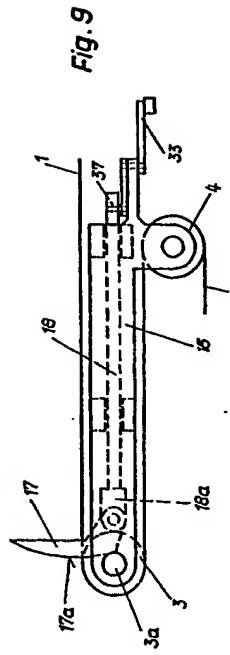


Fig. 9

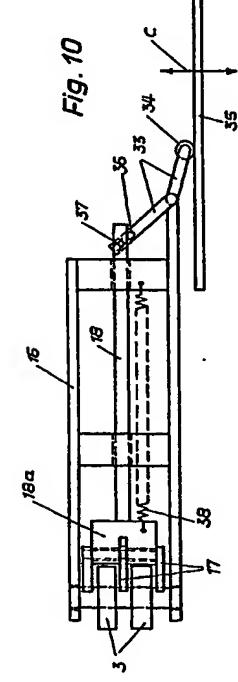


Fig. 10

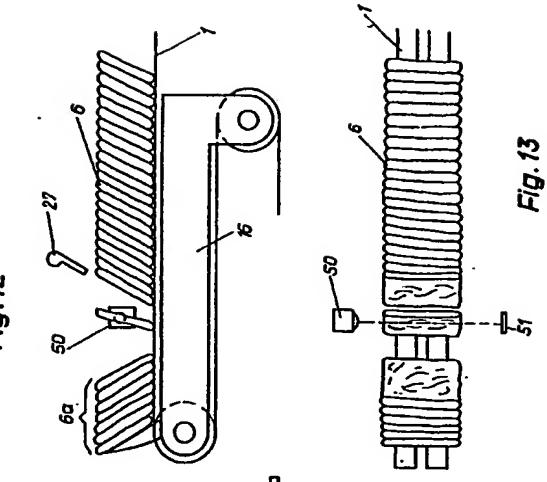


Fig. 12

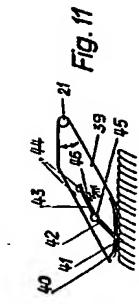


Fig. 11

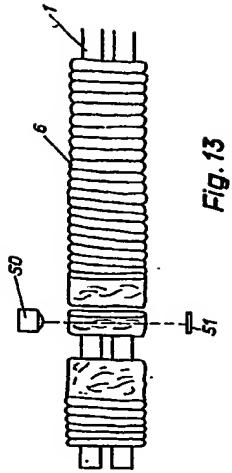


Fig. 13